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TWO-STAGE CISTERN FLUSHING

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(56) Prior Art Documents
14943/83 E03D 1/14
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(57) Claim

1. Improvements in a two stage flush system for a toilet cistern having a flushing valve at the lower end of an overflow tube, which co-operates with a valve seat in the base of the cistern and opens upon lifting of the overflow tube,

comprising at least one manually operable device on the cistern coupled to the overflow tube for lifting the tube to open the valve, and weight regulating means operatively associated with the tube which alternatively does increase or does not increase, the effective weight of the tube so that the valve will close alternatively after a part flush or a full flush of the cistern, and means interconnecting the manually operable device (or devices) to the weight regulating means, and arranged to selectively control the weight regulating means for effecting said part flush and full flush.

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COMPLETE SPECIFICATION

(TRUE COPY)

I certify that the following seventeen pages are a true and correct copy of the description and claims of the original complete specification in respect of an invention entitled IMPROVEMENTS IN TWO-STAGE CISTERN FLUSH SYSTEMS

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This invention relates to improvements in a two-stage flush system for a toilet cistern, as described generally in my Australian Patent ~~Application No~~ 565079 (24255/84) ~~(the 2000) on which this is an Application for a Patent of Addition.~~

In the Complete specification accompanying the said Application, several alternative latch mechanisms were described and illustrated, and there was also described and illustrated one arrangement whereby a weight was alternatively lifted from the upper end of an overflow tube, or allowed to rest upon the overflow tube for full and half flush functions, the lifting being effected between two magnetic surfaces which constituted a magnetic latch.

The main object of this invention is to provide improvements particularly to devices of the latter general type, the improvements being directed primarily to the avoidance of the use of latch mechanisms. It will be appreciated by those skilled in the art that latch mechanisms frequently involve the interengagement of surfaces which are under very moist conditions, and are sometimes required to be associated with components which are not constrained to move within close tolerances. For those reasons, latch mechanisms are prone to problems of malfunction, and the main object of this invention is to

provide improvements whereby latch mechanisms are avoided.

One of the requirements for the part flush mode of a two-stage cistern flush device is that the part flush should be determined accurately, and that there is little danger of frictional surfaces for example interfering with the quantity of water which is discharged, and another object of this invention is to provide a very positive means whereby the quantity of water to be discharged is unlikely to vary except within small tolerance levels, in the part flush mode of the cistern.

In one embodiment, this invention consists of a toilet cistern having a flushing valve at the lower end of an overflow tube, which co-operates with a valve seat in the base of the cistern and opens upon lifting of the overflow tube, comprising at least one manually operable device on the cistern coupled to the overflow tube for lifting the tube to open the valve, and weight regulating means so coupled to said manually operable device that it alternatively does vary, or does not vary, the effective weight of the tube so that the valve will close alternatively after a part flush or a full flush of the cistern.

By utilising weight regulating means (which could either be a cup, a weight or a float on or coupled to the tube, depending upon the weight and effective buoyancy of the cistern valve and overflow tube combination) as water level drops to or below the weight regulating

means, the effective weight of the valve member and tube increases very rapidly thereby enabling a part flush mode to be initiated within a small tolerance of water level variation. Additionally, the weight can be a toppling weight which passes "over centre", or the weight of water in a spoon, which bears downwardly on the tube.

The weight responsive means which controls the overflow tube and valve combination avoids the need for interengaging latch surfaces, and can be either magnetic or can be controlled by pivotting weight, in both cases with a high degree of reliability of accuracy and very little danger of malfunction, although latch means can also be used.

While the invention need not necessarily include the abovementioned details, five embodiments are described hereunder in further detail and are illustrated in the accompanying diagrammatic sketches in which:

Fig. 1 is a diagrammatic section illustrating a first embodiment wherein a magnetic weight responsive means selectively releases or retains a cistern valve in its elevated position for either part flush or full flush mode operation of a cistern,

Fig. 2 illustrates a second embodiment which is a slight variation of the magnetic means of Fig. 1,

Fig. 3 illustrates a third embodiment wherein the weight responsive means comprises pivotted weights and

the effective weight of the valve and overflow tube combination is varied both by tilting of those weights and by float means,

Fig. 4 illustrates in section a fourth embodiment utilising a counter balance weight arrangement which, upon tilting, reduces the effective weight of the overflow tube,

Fig. 5 illustrates the push button assembly of Fig. 4 in elevation,

Fig. 6 is a plan section of Fig. 4 taken on line 6-6 thereof, and

Fig. 7 illustrates a fifth embodiment which utilises a spoon weight arrangement.

In all the described embodiments, a two-stage flush cistern for a toilet cistern having a valve 10 at the lower end of an overflow tube 11 which co-operates with a valve seat 12 in the base 13 of a cistern 14 and opens upon lifting of the overflow tube 11, comprises at least one manually operable device designated 16 in all embodiments coupled to the overflow tube 11 for lifting the tube to open the valve 10 the device 16 including weight regulating means which, when operated, vary the effective weight of the tube so that the valve 10 will close alternatively after the part flush or full flush of the cistern.

In the first embodiment of Fig. 1, the lid 18 of

the cistern 14 is provided at its upper end with a lift knob 19 which depends through the lid 18 and into the cistern 14, the lower end of the lift knob 19 having a slot 20 which accommodates a transverse pin 21 in the upper end of the overflow tube 11. There is also provided a stripper bar 22 having two depending ends, secured to the underside of the lid 18, and there is an annular magnetic ring 23 concentric with the depending portion of lift knob 19. The lift knob 19 is provided with an outstanding magnetic ring 24 and there is also provided a buoyant weight 25 which includes a pair of float members 26 on its underside, and a magnetic ring 27 on its upper side. At least two of the magnetic rings 23, 24 and 27 are rings of polymeric material containing ferrite powder, this material having excellent corrosion resistant characteristics and constant long lasting magnetic characteristics.

Weight regulating means is further provided intermediate the ends of overflow tube 11, in this embodiment comprising an upwardly facing cup 28 which, as water level descends, entraps some water and thereby the effective weight of overflow tube 11 is substantially increased, thus applying more downward force on the tube 11 and its valve 10 than exists when it is immersed wholely in the water within the cistern. A similar cup 29 is located at the lower

end of the overflow tube 11 and above valve seat 12.

In operation, the cistern 14 will fill up to a level where floats 26 lift the buoyant weight 25 until the two magnetic rings 24 and 27 contact one another, and in this position any upward movement of the lift knob 19 will result in upward movement of buoyant weight 25, as well as upward movement of the overflow tube and valve member combination. Provided the upward movement terminates without breaking the magnetic interface between rings 24 and 27, the buoyant weight 25 will be retained against dropping by magnetic force and the cistern flush will continue in the normal way until the magnetic interface is finally broken by the combined weights of water in cups 28 and 29, that is, after full flush.

If however, the knob 19 is pulled up a sufficient distance to break the magnetic interface between rings 24 and 27 and establish an interface between the ring 23 and the fixed ring 24, the buoyant weight 25 will come to rest on the top of the overflow tube 11, and its weight will be added to that of the tube 11. However, the arrangement is such that this weight in itself is not sufficient to close the valve during the flush cycle, until such time as the cup 28 becomes a weighted member due to the water level in the cistern dropping below its upper edge. Sufficient weight is then imparted to

the combination, by the weight of water within the cup 28 and the weight 25, that the valve is caused to close prematurely thus causing a part flush. It will be appreciated that it is very easy for an operator to distinguish between the need to pull lightly for a part flush, or apply the additional force required to achieve the full flush. Alternatively, two push buttons are separately coupled to the overflow tube 11 to provide the required lifting effect.

Fig. 2 illustrates a second embodiment wherein an alternative arrangement uses two push buttons 31 and 32 which lift respectively the overflow tube 11 through a lever arm 33, or a magnetic weight 34 through a lever arm 35. In the event that the push button 31 is actuated, the lever arm 33 lifts the overflow tube 11 to establish a flushing mode, but the magnetic weight 34 does not come into contact with magnet 36 on the lid 18. Thus the weight 34 is available and effective for premature closing of the overflow tube and valve combination in the same way as the weight 25 of the first embodiment. If however the button 32 is pushed, the magnetic weight 34 has an initial upward movement within the upper end of the overflow tube 11, which is arrested by the inturned flange 38, and any further upward movement then lifts the overflow tube and valve member combination until

there is a magnetic interface established between the magnetic weight 34 and the magnet 36, and in this situation the magnetic interface is broken only when the two cups 28 and 29 are both weighted members due to the lowering of the surface level of the water within the cistern. In some instances cup 28 is not required.

In a variation of Fig. 2 (not herein illustrated), only the lever arm 33 is operative, but is operated alternatively by two buttons, one being closer to the pivot point of lever arm 33 than the other. If the inner button is pressed, overflow tube 11 is lifted sufficiently to establish a magnetic interface which retains tube 11 in its upper position for the entire flush function. If the outer button 31 is pressed, there is less angular movement of arm 33, the magnetic interface is not established, and the flush terminates prematurely.

An alternative embodiment is illustrated in Fig. 3 where use is made of weights W1 and W2 in lieu of magnets for suspension of the overflow tube and valve combination. It is assumed that the overflow tube and valve combination is heavier than illustrated in Figs. 1 and 2, the weight regulating means in this embodiment is constituted by an annular float 40 on tube 11, which has an upward lifting force due to its own buoyancy when the water level is above the float. There are provided

two push buttons 41 and 42, the push button 42 being shown in its depressed condition, and each push button is coupled by a respective link 43 to a lever arm 44 having a slotted end 45 at its other end, and an intermediate upstanding limb 46. The push button 41 is associated with the heavy weight W1 and the push button 42 with a light weight W2. If both push buttons are in their upper position, then the weights W1 and W2 topple, and pass an "over-centre" position having a moment arm "A" tending to retain them in that position, and the respective pins 48 are in the upper ends of slots 49 of the slotted ends 45 of the lever arm 44. However when one of the buttons is pushed (as illustrated with button 42) the respective lever arm 44 rocks about its pivot pin 50, lifting the overflow tube and valve member combination by means of its respective lift link 51, the other pin 48 sliding upwardly through its respective slot 49 during its lifting motion. The weight (W2 in this instance) which is a relatively small weight then rocks across to retain the lever arm 44 in a sloping position by reason of moment arm 'B' and retain the button 42 in its depressed condition until such time as the water lever (WL) drops below the annular float 40. At that stage, the effective weight of the combination overflow tube and valve member increases, causing the clockwise moment of the lever

arm 44 to be overcome and returning the weight back to its over-centre stable condition whereupon the push button is again lifted, and a part flush is effected. (In some instances weight W2 can be dispensed with.)

If however the push button 41 is depressed, the weight W1 in being greater than the weight W2 does not respond to the increase of weight until such time as the cup 29 becomes a weighted member due to the water level dropping below it, and only at this stage will the lever arm 44 be returned to its normal position. Thus a full flush is effected.

Referring now to the embodiment of Figs. 4, 5 and 6, the cistern lid 18 carries on it a push button assembly 55 which forms part of the manually operable device and carries two "half push buttons" 56 and 57, the half 56 terminating at its lower end in a cross-bar 58 which overlies a first lever arm 59 (constituted by two leaves as shown in Fig. 6) while the half button 57 terminates at its lower end in an abutment projection 60 and this is located above an end of a second lever arm 61. Both lever arms pivot about a common pivot pin 62 and a linkage pin 63 couples the second lever arm 61 to a slidable sleeve 64 which rides up over the overflow tube 11 and lifts the tube by abutment with an outstanding flange 65, this coupling being through depending link 66. The

first lever arm 59 normally underlies the linkage pin 63 and only co-operates with that pin when the half button 56 is depressed for full flush. A spring (or springs) 67 functions to return both parts of the push button when not depressed.

The weight "W" is carried on an upstanding element 69 of the first lever arm 59 and this topples over the axis of pivot pin 62 when half button 56 is depressed, thus reducing the effective weight of the overflow tube 11 and its valve 10. Although in many instances not necessary, there is provided a float which provides extra buoyancy to the overflow tube when the tube is in the raised position and assists in the smooth and consistent closure of the tube at both half and full flush termination. Alternatively, a simple clip-on float could be attached to the tube and any existing flotation means for the tube could be rendered inoperable.

In the last embodiment of Fig. 7, the overflow tube 11 has an abutment pin 71 projecting from it, the upper surface of pin 71 being abutted by a spoon arm 72 having a spoon 73 at one end. The under surface of pin 71 is abutted by a lever arm 74, which in some instances is identical with an "original equipment" lever arm. Both arms 72 and 74 pivot about pin 76, and the spoon arm 72 is actuated by a "full flush" spring loaded push button

77, while the lever arm 74 is actuated by a "part flush" spring loaded push button 78. If button 78 is depressed, both arms 72 and 74 pivot about pin 76, but spoon 73 retains sufficient water that the weight imparted against abutment pin 71 causes premature termination of flush. If however button 77 is depressed, spoon 73 tilts sufficiently to empty its water (as shown in dotted lines), and full flush is achieved.

A consideration of the above embodiments will indicate that the invention is extremely simple and in all instances avoids the use of latches. It will be appreciated that the selection of an annular cup 28 or an annular float 40 will depend upon the weight and buoyancy of the combination of the overflow tube and valve member, and in some instances use can be made of both.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Improvements in a two stage flush system for a toilet cistern having a flushing valve at the lower end of an overflow tube, which co-operates with a valve seat in the base of the cistern and opens upon lifting of the overflow tube, comprising at least one manually operable device on the cistern coupled to the overflow tube for lifting the tube to open the valve, and weight regulating means operatively associated with the tube which alternatively does increase or does not increase, the effective weight of the tube so that the valve will close alternatively after a part flush or a full flush of the cistern, and means interconnecting the manually operable device (or devices) to the weight regulating means, and arranged to selectively control the weight regulating means for effecting said part flush and full flush.

2. Improvements according to claim 1 further comprising an upwardly facing cup carried by the overflow tube intermediate the ends thereof and at a location that it fills with water as the cistern fills with water.

3. Improvements according to claim 1 further comprising a float carried by the overflow tube intermediate the ends thereof and at a location that it becomes submerged as the cistern fills with water.

4. Improvements according to claim 1 wherein said weight regulating means comprises a spoon which, upon filling of the cistern to its normal water level, also becomes filled with water, and a spoon arm engageable over an abutment surface on the overflow tube, and pivot

means which mount the spoon arm for pivotal movement away from or towards the abutment surface.

5. Improvements according to claim 2 or claim 3 wherein said manually operable device comprises a lift knob or equivalent button mechanism depending into the cistern and having a vertically elongate slot near its lower end housing a pin in the overflow tube, a first magnetic member carried by the lift knob, a buoyant weight overlying the overflow tube but depending downwardly to be immersed in cistern water when at its normal water level, a second magnetic member on the buoyant weight co-operable with the first magnetic member when the weight floats, a third magnetic member fixed with respect to the cistern and located above the second magnetic member, and a stripper bar fixed with respect to the cistern and engageable against the buoyant weight,

such that initial lifting of the lift knob retains the buoyant weight in a lifted position for normal flush, but further lifting of the lift knob strips the buoyant weight from the second magnetic member such that the buoyant weight rests on the upper end of the overflow tube and thereby increases its effective weight causing the valve to close after a part flush.

6. Improvements according to claim 2 or claim 3

wherein the upper end of the tube carries a magnetic weight co-operable with a magnet which is fixed with respect to the cistern, and means constraining the magnetic weight for limited upward movement only with respect to the tube, said manually operable device comprising two push buttons respectively coupled to the magnetic weight and the tube for full and part flush actuation of the cistern.

7. Improvements according to claim 2 or claim 3 wherein said manually operable device comprises two lever arms, and two push buttons each coupled to one end of respective said lever arms, the other end of each said lever arm being coupled to the upper end of the tube by a pin-and-slot connection, and a lever weight (or respective weights of unequal size) carried by one (or each) said lever arm, the (or each) said weight being movable from a first position wherein closure of the cistern valve is assisted by that said weight to a second position wherein opening of the cistern valve is assisted, upon tilting of the relevant lever arm by depression of the relevant push button.

8. Improvements according to claim 2 or claim 3 wherein said manually operable device comprises two push buttons,

a first lever arm and linkage coupling a first push

button to the tube for lifting of the tube upon depression of that push button,

a second lever arm and linkage coupling a second push button to the tube for lifting of the tube upon depression of said second push button,

and a weight operatively associated with one of said lever arms which varies the effective weight of the tube when lifted by actuation of that said lever arm thereby retaining the cistern valve open for full flush.

9. Improvements according to claim 8 wherein said weight is a counter balance weight carried by said one of said lever arms which is tilted upon actuation of that lever arm, and upon such tilting, reduces the effective weight of the tube.

10. Improvements according to claim 8 or claim 9 wherein each said lever arm pivots independently about a common pivot pin, and is separately actuated by its respective said button.

11. Improvements according to claim 4 wherein said manually operated devices comprises a pair of push buttons spaced away from the spoon arm pivot means by different distances and respectively operable to tilt the spoon arm by an amount insufficient, and an amount sufficient to discharge water from the spoon.

12. Improvements in a two stage flush system for a toilet cistern substantially as hereinbefore described with reference to and as illustrated in Fig. 1 of the accompany drawings.

13. Improvements in a two stage flush system for a toilet cistern substantially as hereinbefore described with reference to and as illustrated in Fig. 2 of the accompanying drawings.

14. Improvements in a two stage flush system for a toilet cistern substantially as hereinbefore described with reference to and as illustrated in Fig. 3 of the accompanying drawings.

15. Improvements in a two stage flush system for a toilet cistern substantially as hereinbefore described with reference to and as illustrated in Figs. 4, 5 and 6 of the accompanying drawings.

16. Improvements in a two stage flush system for a toilet cistern substantially as hereinbefore described with reference to and as illustrated in Fig. 7 of the accompanying drawings.

Dated this 7th day of June , 1985.

NIGEL JAMES CROSER,

By his Patent Attorneys,
R.K. MADDERN & ASSOCIATES

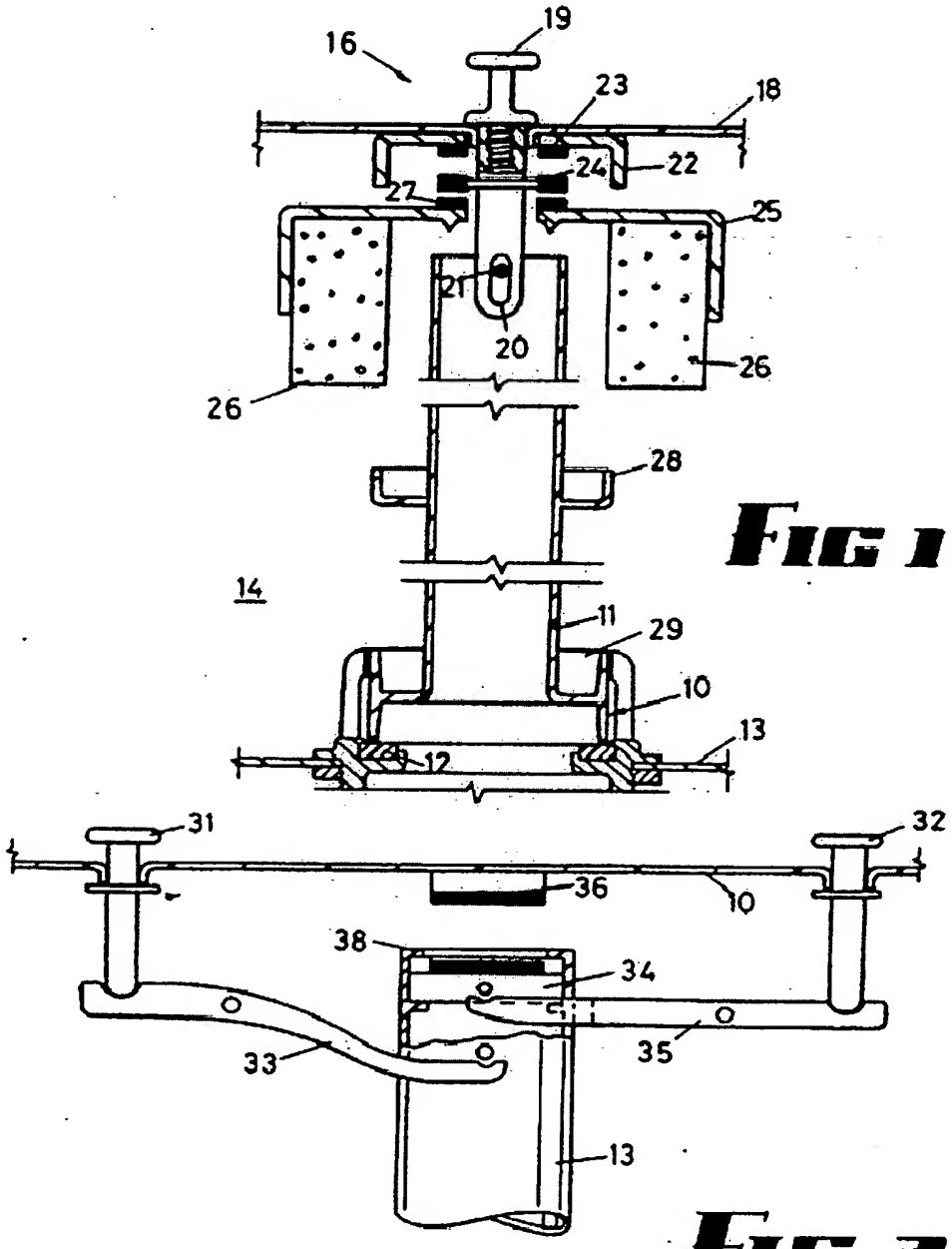
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FIG 1

FIG 2

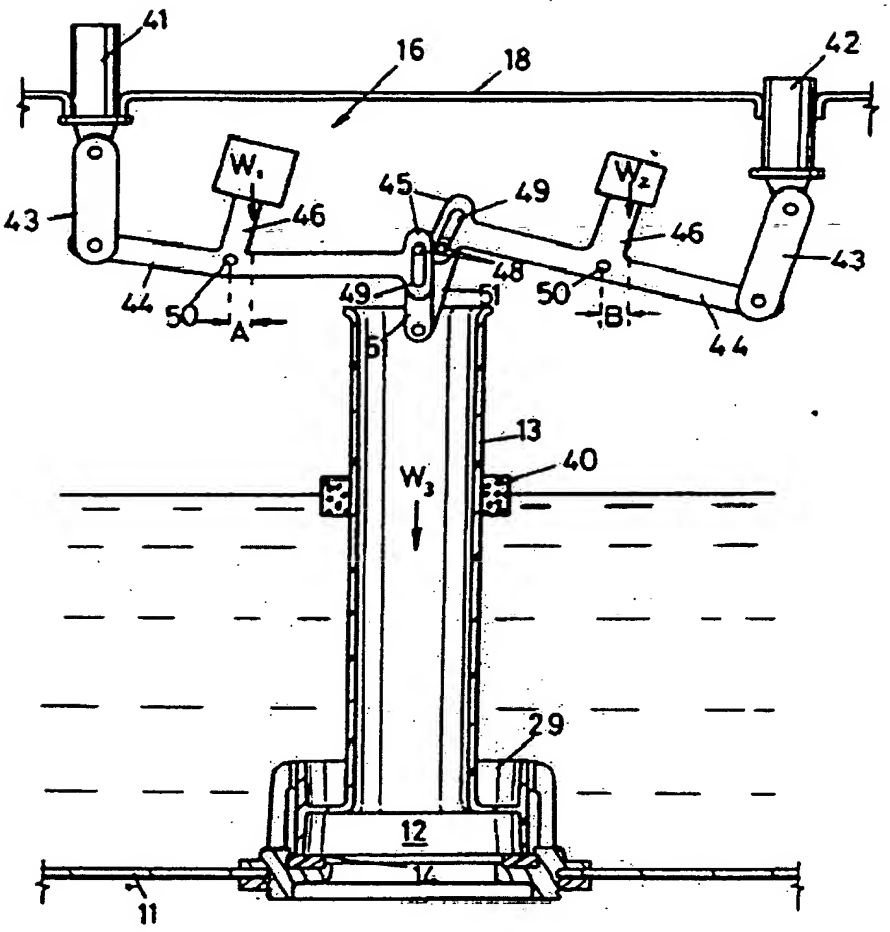

FIG 3

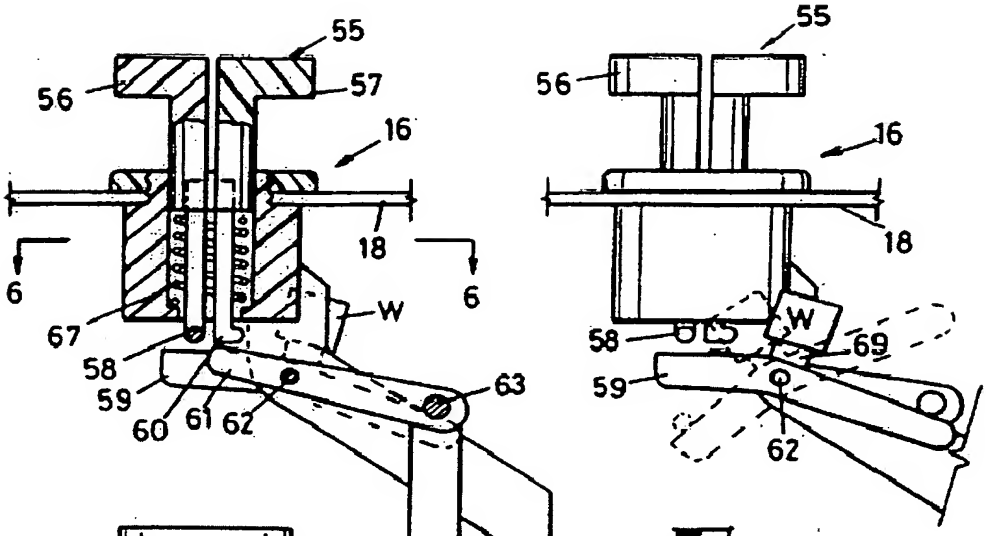

FIG 5

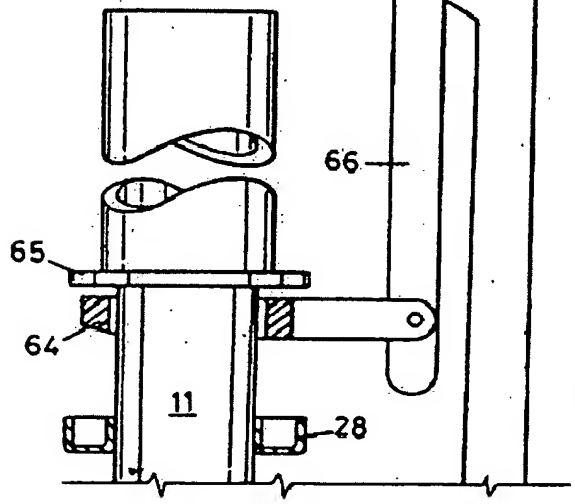

FIG 4

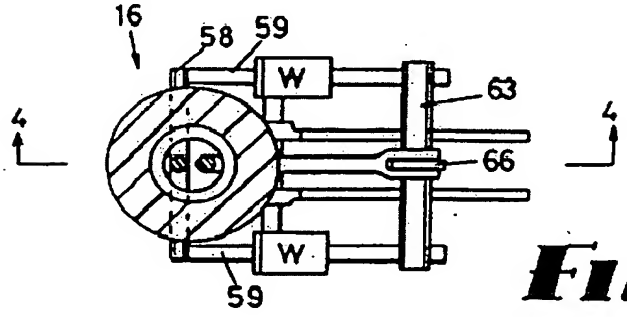

FIG 6

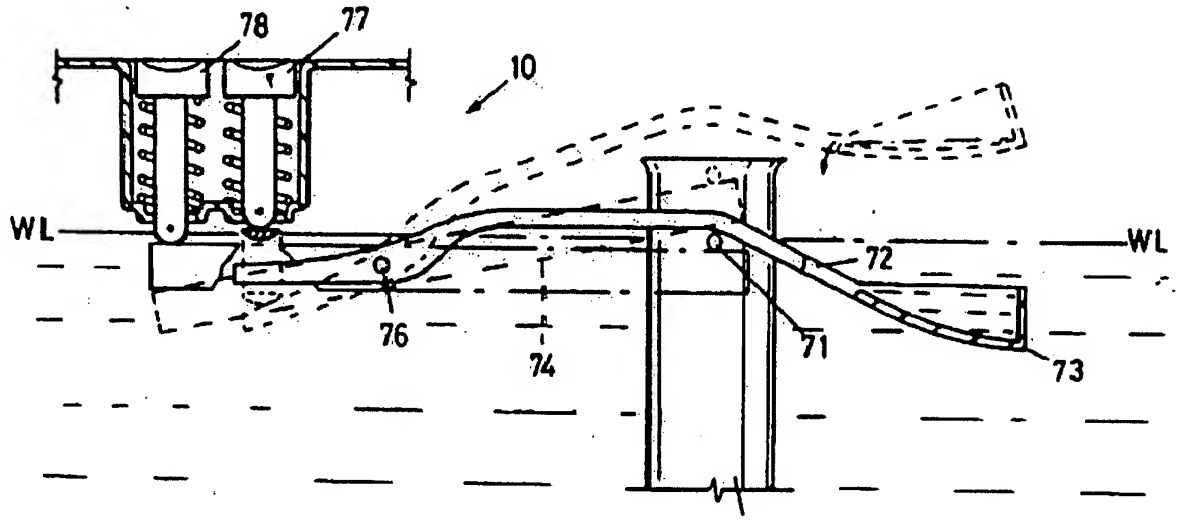

FIG 7